Arlington High School Building Committee

Meeting Date: **Tuesday, March 24, 2020 - 6:00 pm**
Conducted by Remote Participation

Agenda

1. HMFH Update
   - Geo-thermal Test Well Update
2. Skanska Update
   - Early Bid Package Approval
3. Consigli Update
4. Approval of Minutes
5. New Business

Members of the public are asked to send written comment to ktassone@arlington.k12.ma.us. Documents regarding agenda items will be made available via the Town's website.

https://www.mass.gov/doc/open-meeting-law-order-march-12-2020/download

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COMMONWEALTH OF MASSACHUSETTS
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CHARLES D. BAKER
GOVERNOR

KARYN E. POLITO
LIEUTENANT GOVERNOR

ORDER SUSPENDING CERTAIN PROVISIONS OF THE OPEN MEETING LAW, G. L. c. 30A, § 20

WHEREAS, on March 10, 2020, I, Charles D. Baker, Governor of the Commonwealth of Massachusetts, acting pursuant to the powers provided by Chapter 639 of the Acts of 1950 and Section 2A of Chapter 17 of the General Laws, declared that there now exists in the Commonwealth of Massachusetts a state of emergency due to the outbreak of the 2019 novel Coronavirus ("COVID-19"); and

WHEREAS, many important functions of State and Local Government are executed by "public bodies," as that term is defined in G. L. c. 30A, § 18, in meetings that are open to the public, consistent with the requirements of law and sound public policy and in order to ensure active public engagement with, contribution to, and oversight of the functions of government; and

WHEREAS, both the Federal Centers for Disease Control and Prevention ("CDC") and the Massachusetts Department of Public Health ("DPH") have advised residents to take extra measures to put distance between themselves and other people to further reduce the risk of being exposed to COVID-19. Additionally, the CDC and DPH have advised high-risk individuals, including people over the age of 60, anyone with underlying health conditions or a weakened immune system, and pregnant women, to avoid large gatherings.

WHEREAS, sections 7, 8, and 8A of Chapter 639 of the Acts of 1950 authorize the Governor, during the effective period of a declared emergency, to exercise authority over public assemblages as necessary to protect the health and safety of persons; and

WHEREAS, low-cost telephone, social media, and other internet-based technologies are currently available that will permit the convening of a public body through virtual means and allow real-time public access to the activities of the public body; and

WHEREAS section 20 of chapter 30A and implementing regulations issued by the Attorney General currently authorize remote participation by members of a public body, subject to certain limitations;

NOW THEREFORE, I hereby order the following:

(1) A public body, as defined in section 18 of chapter 30A of the General Laws, is hereby relieved from the requirement of section 20 of chapter 30A that it conduct its meetings in a public place that is open and physically accessible to the public, provided that the public body makes provision to ensure public access to the deliberations of the public body for interested members of the public through adequate, alternative means.

Adequate, alternative means of public access shall mean measures that provide transparency and permit timely and effective public access to the deliberations of the public body. Such means may include, without limitation, providing public access through telephone, internet, or satellite enabled audio or video conferencing or any other technology that enables the public to clearly follow the proceedings of the public body while those activities are occurring. Where allowance for active, real-time participation by members of the public is a specific requirement of a general or special law or regulation, or a local ordinance or by-law, pursuant to which the proceeding is conducted, any alternative means of public access must provide for such participation.

A municipal public body that for reasons of economic hardship and despite best efforts is unable to provide alternative means of public access that will enable the public to follow the proceedings of the municipal public body as those activities are occurring in real time may instead post on its municipal website a full and complete transcript, recording, or other comprehensive record of the proceedings as soon as practicable upon conclusion of the proceedings. This paragraph shall not apply to proceedings that are conducted pursuant to a general or special law or regulation, or a local ordinance or by-law, that requires allowance for active participation by members of the public.

A public body must offer its selected alternative means of access to its proceedings without subscription, toll, or similar charge to the public.

(2) Public bodies are hereby authorized to allow remote participation by all members in any meeting of the public body. The requirement that a quorum of the body and the chair be physically present at a specified meeting location, as provided in G. L. c. 30A, § 20(d) and in 940 CMR 29.10(4)(b), is hereby suspended.

(3) A public body that elects to conduct its proceedings under the relief provided in sections (1) or (2) above shall ensure that any party entitled or required to appear before it shall be able to do so through remote means, as if the party were a member of the public body and participating remotely as provided in section (2).

(4) All other provisions of sections 18 to 25 of chapter 30A and the Attorney General's implementing regulations shall otherwise remain unchanged and fully applicable to the activities of public bodies.

This Order is effective immediately and shall remain in effect until rescinded or until the State of Emergency is terminated, whichever happens first.

Given in Boston at 5:49 PM this 12th day of March, two thousand and twenty.

CHARLES D. BAKER
GOVERNOR
Commonwealth of Massachusetts

HMFH

OFFICE. (617) 492 2200
FAX. (617) 876 9775

130 Bishop Allen Drive
Cambridge, MA 02139

hmfh.com

MEMORANDUM

date: 03.21.2020

from: HMFH Architects, McPhail Associates, Bala Engineers

to: AHS Building Committee

re: Geothermal Wells

On Monday, February 24, 2020 the first geothermal test well was stopped when Naphthalene (NAPL) was discovered in bedrock approximately 160' below surface. (See Field Report for more detail.) In short, this is a known substance as it relates to the known contaminants from previous activities on the AHS site, BUT it is now found in a previously unknown location. Prior to this, the project/Town has been aware of contaminated soils, we are now aware of contaminated bedrock.

HMFH and its consultants were tasked by the SBC at its March 3, 2020 meeting to investigation alternative well locations and scenarios. And to identify the risks, impacts, and relative, approximate costs associated with the alternative scenarios. Below is a narrative of the different options investigated. We have indicated the level of risk using 1 through 5, with 5 having the highest level of risk. Risk refers to level of contamination and future unknown environmental impacts.

Included, attached herein are:
-site plan graphics with bulleted aspects of each option
-McPhail memo evaluating each option
-McPhail Field Report dated February 24, 2020

OPTIONS 1/1A:
Option 1 and 1A are at the original proposed location of Peirce Practice Field. This is the same location as the initial test well noted above. Option 1 is for (130) 500-foot deep wells. Option 1A is for approximately (70) 900-foot deep wells. A test well program is required, but this area is presumed to have the highest level of contaminants at bedrock because 1) it has been identified in the initial test well, and 2) it is closest to the original contaminant source to the west.

Because the contaminant is located ~160 feet below grade, the Design Team has no way of knowing what future environmental impact the drilling of wells could/would have.

Due to finding this known contaminant (NAPL) in a previously unknown location (bedrock), increased health and safety protocols will need to be observed if drilling in the location of Peirce Practice Field. Additional installation procedures will need to be followed to drill in the location of Peirce Practice Field. The estimated range of increase to the project budget due to the increased protocols and procedures is $1.85m to $3.5m.

We anticipate that the increased protocols and procedures would mean the well installation will take longer than originally anticipated. Each well may take between 3 and 5 days to drill and depending on whether there are 130 or 70 wells, and assuming two rigs working at a time, the approximate duration for installation ranges from five (5) to 16 months. The longer the well installation takes, the more likely there will be project schedule impacts.

We anticipate impacts to construction logistics and the school parking capacity, which will likely incur additional costs.

The building's mechanical design would remain as is currently designed in the 60% construction documents set.

RISK = 5
Options 1 and 1A are not recommended.

OPTION 2
Option 2 proposes to locate either (130) 500-foot deep wells or approximately (70) 900-foot deep wells at the northeast corner of the school site where the current softball field is located. A test well program is required, but due to its distance from the known source of contamination to the west, this area is presumed to have a mid-level risk of contaminants at bedrock.

Because contaminants may be located in the bedrock, the Design Team has no way of knowing what future environmental impact the drilling of wells could/would have.

Due to the potential for finding contaminant in bedrock, there is the potential to require increased health and safety protocols and additional installation procedures. The estimated potential range of increase to the project budget is $925k to $1.75m.

As noted in Option1/1A, the potential for increased protocols and procedures would mean the well installation will take longer than originally anticipated and the longer the well installation takes, the more likely there will be project schedule impacts.

A complexity of Option 2's well field location is there will need to be a much longer piping route from the wells to the Phase I mechanical room located at the west end

(in the Performing Arts wing). This route would require traversing over the Mill Brook culvert and up the embankment at the east side of the STEAM wing, which is already a very complicated and crowded (underground) area of the site. This piping route will likely incur increased costs, impacts to construction logistics, and potential project schedule impacts. And the longer pipe travel will increase geothermal pump energy use.

We anticipate impacts to the school parking capacity, which likely will incur additional costs.

The building's mechanical design would remain as is currently designed in the 60% construction documents set.

IF the test well program was to show similar contamination at this area of the site as at the Peirce Practice Field and therefore incur a similar level of increased costs and impact to the project schedule, the SBC may then decide to abandon the geothermal wells. IF this were to occur, for example in July, and a redesign of the building's mechanical system (with structural and architectural impacts) were to be required, this would have a significant impact on the project schedule, shifting all phased project completion dates. Please note: the structural design for Phase I is being priced and readied for early bidding in April.

RISK = 2
Option 2 is not recommended.

OPTION 2A

Option 2A proposes to locate the well program in two locations. Approximately (35) 900-foot deep wells will be located at the Mill Brook parking lot and would serve the Humanities wing. And approximately (35) 900-foot deep wells will be located at the front green to the west of the new main entrance and would serve the STEAM wing. Two test well programs are required. Due to its distance from the known source of contamination to the west, the Mill Brook parking lot is presumed to have a low level of risk of contaminants. Due to the known PCE contamination at the front green, we anticipate a high level of potential risk for contamination at bedrock.

Because contaminants may be located in the bedrock, the Design Team has no way of knowing what future environmental impact the drilling of wells could/would have.

Due to the potential for finding contaminant in bedrock, there is the potential to require increased health and safety protocols and additional installation procedures. The estimated potential range of increase to the project budget is $925k to $1.75m.

As noted in Option1/1A, the potential for increased protocols and procedures would mean the well installation will take longer than originally anticipated and the longer the well installation takes, the more likely there will be project schedule impacts.

We anticipate impacts to construction logistics due to locating a well program on the already crowded and logistically challenging front green.

We anticipate impacts to the school parking capacity, which likely will incur additional costs.

The building's mechanical design would require revisions to incorporate the second mechanical room at the Humanities wing and changes to internal mechanical routes, and would incur increased costs, estimates up to $20k.

RISK = 4
Option 2A is not recommended.

OPTION 3
Option 3 proposes to locate a well program of approximately (35) 900-foot deep wells at the Mill Brook parking lot and would serve the Humanities wing only. A test well program is required. Due to its distance from the known source of contamination to the west, the Mill Brook parking lot is presumed to have a low level of risk of contaminants.

While seemingly a low risk, but because contaminants may be located in the bedrock, the Design Team has no way of knowing what future environmental impact the drilling of wells could/would have.

Due to the potential for finding contaminant in bedrock, there is the potential to require increased health and safety protocols and additional installation procedures. The estimated potential range of increase to the project budget is $460k to $875k. BUT since the number of geothermal wells to be drilled is decreased by half, we anticipate a decrease of project cost estimated at $2.5m.

As noted in Option1/1A, the potential for increased protocols and procedures would mean the well installation will take longer than originally anticipated, but since the proposed location of wells is to serve the Phase II building, the longer processes would likely be absorbed into the overall project schedule.

We anticipate impacts to the school parking capacity, which likely will incur additional costs.

The building's mechanical design would need to be redesigned to change the STEAM wing from geothermal sourced system. At minimum the redesign would be to a modified hydronic system or, more impactful to a VRF system. The redesign of

the mechanical (along with structural and architectural implications) would incur increased costs, estimated up to $60k. And an increase of the design schedule up to four (4) weeks, which will likely impact the overall project schedule.

RISK = 1
Option 3 is not recommended.

OPTION 4
Option 4 proposes elimination of all geothermal wells, therefore there is no risk of contaminants or of unknown future environmental impacts due to the drilling of the wells.

Due to the elimination of geothermal wells, we anticipate a decrease of project cost estimated at $5m.

The building's mechanical design would need to be redesigned to change from geothermal sourced system. At minimum the redesign would be to a modified hydronic system or, more impactful to a VRF system. The redesign of the mechanical (along with structural and architectural implications) would incur increased costs, estimated up to $110k. And an increase of the design schedule up to eight (8) weeks, which will impact the overall project schedule. For instance, it is possible that instead of moving into the Phase I building over December break (2021), the school might move in over February break (2022).

RISK = 0
Option 4 is recommended.

IN SUMMARY:
The Design Team recommends Option 4 with no geothermal wells because it poses the least risk to impacting/increasing the project budget, the least risk of any future environmental impacts, and the least risk of negatively impacting the project schedule.

While all the options pose a risk to the project schedule, only in Option 4 can we manage this risk. All other options are reliant on results of test well programs, potential need for further consideration of the SBC, and review and approvals by DEP (see McPhail's memo). All of which are out of the project's control at this time.

The concepts for the revised mechanical design have been initially discussed with Ryan Katofsky. An analysis of tradeoffs will be done to assist in making a final determination as to which system is best for AHS.

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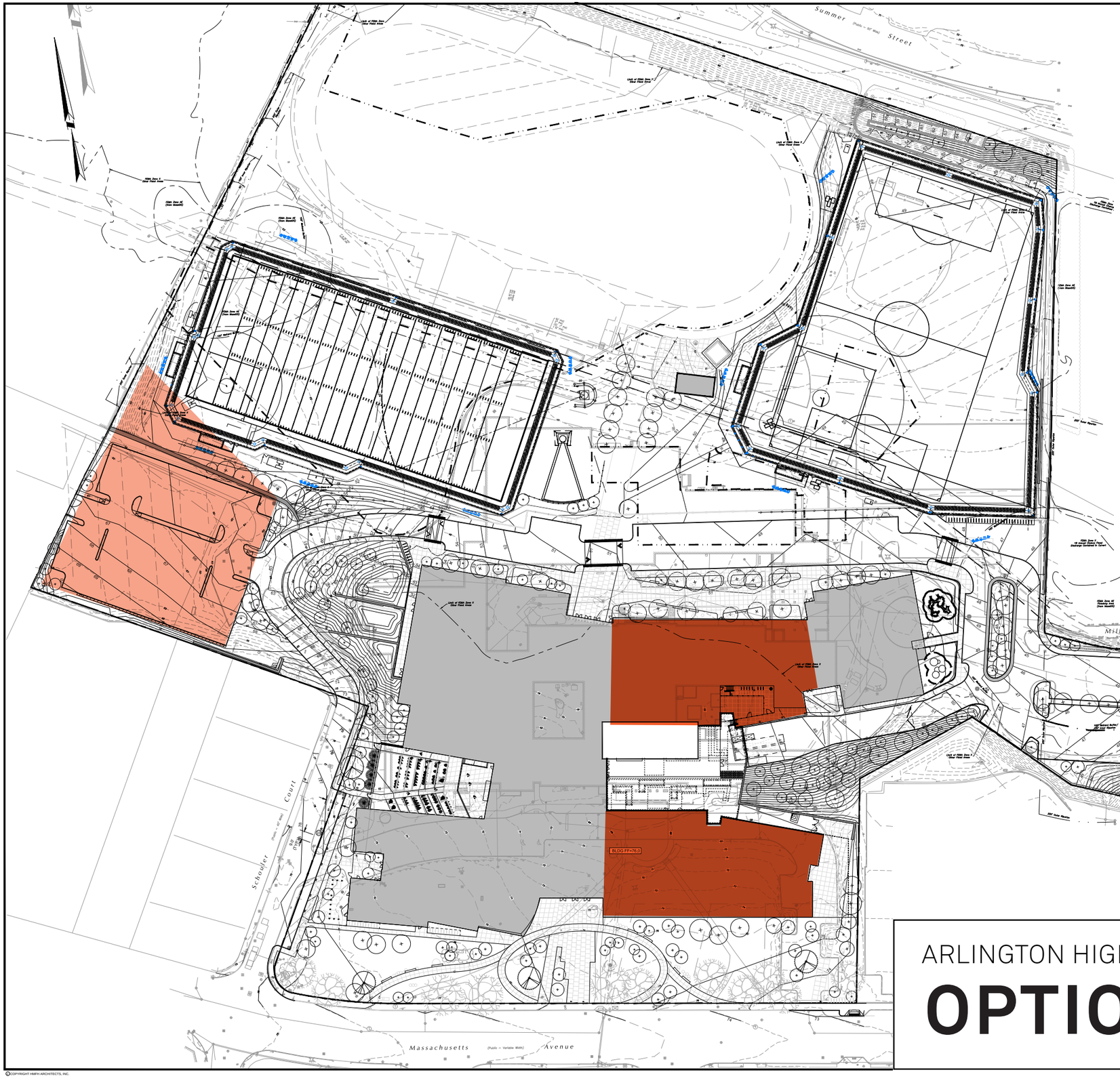


Impacts/Risks

- highest risk of contaminants
- unknown future environmental impacts
- increase to project costs (est. $1.85m-$3.5m)
- extended time for well install (5-16 months)
- schedule impacts (TBD)
- impacts to construction logistics
- impacts to school parking capacity (TBD $)
- no changes to mechanical design

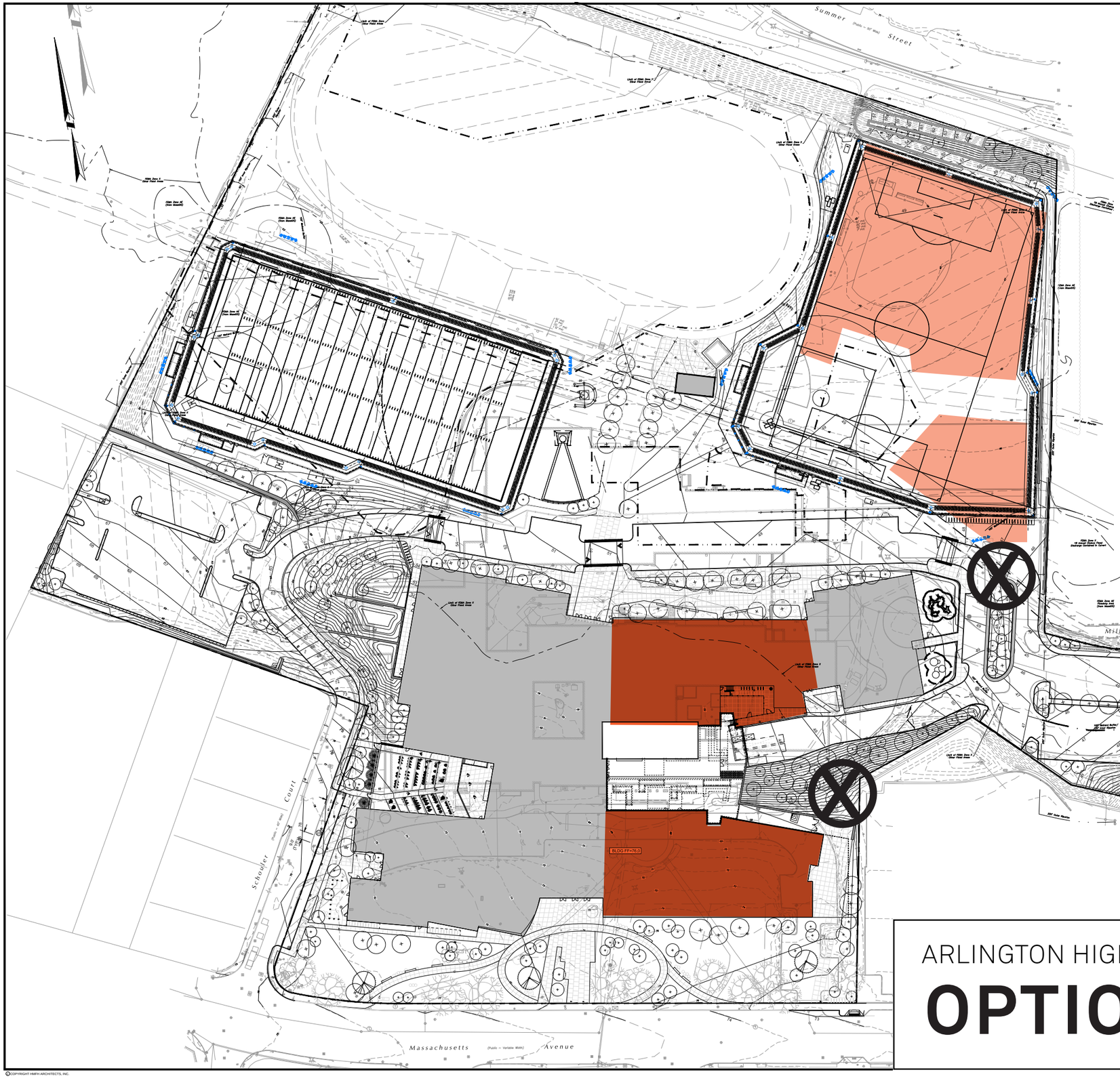
ARLINGTON HIGH SCHOOL GEO-WELL OPTIONS

OPTION 1/1A

HMFH ARCHITECTS
100 Bishop Allen Drive
Cambridge, MA 02139
T 617.547.5400
@HMFHarch hmfh.com

Simpkins Consultants Inc.
Civil/Structural/Land Surveyors
20 A Street
Framingham, MA 01701
T 508.877.6688
F 508.877.8349
www.simplaw.com

CONSTRUCTION DOCUMENTS 60% ESTIMATING SET
03-18-2020



Impacts/Risks

- mid-level risk of contaminants
- unknown future environmental impacts
- potential increase to project costs (est. $925k-$1.75m)
- piping route challenges (added costs TBD)
- schedule impacts (TBD)
- increase energy use due to route length
- impacts to school parking capacity (TBD $)
- no changes to mechanical design

ARLINGTON HIGH SCHOOL GEO-WELL OPTIONS

OPTION 2

HMFH ARCHITECTS
130 Bishop Allen Drive
Cambridge, MA 02139
T 617.547.5400
@HMFHarch hmfh.com

Simpkins Consultants Inc.
Civil/Site Land Development
20 A Street
Framingham, MA 01701
T 508.877.6688
F 508.877.8823
www.skinsinc.com

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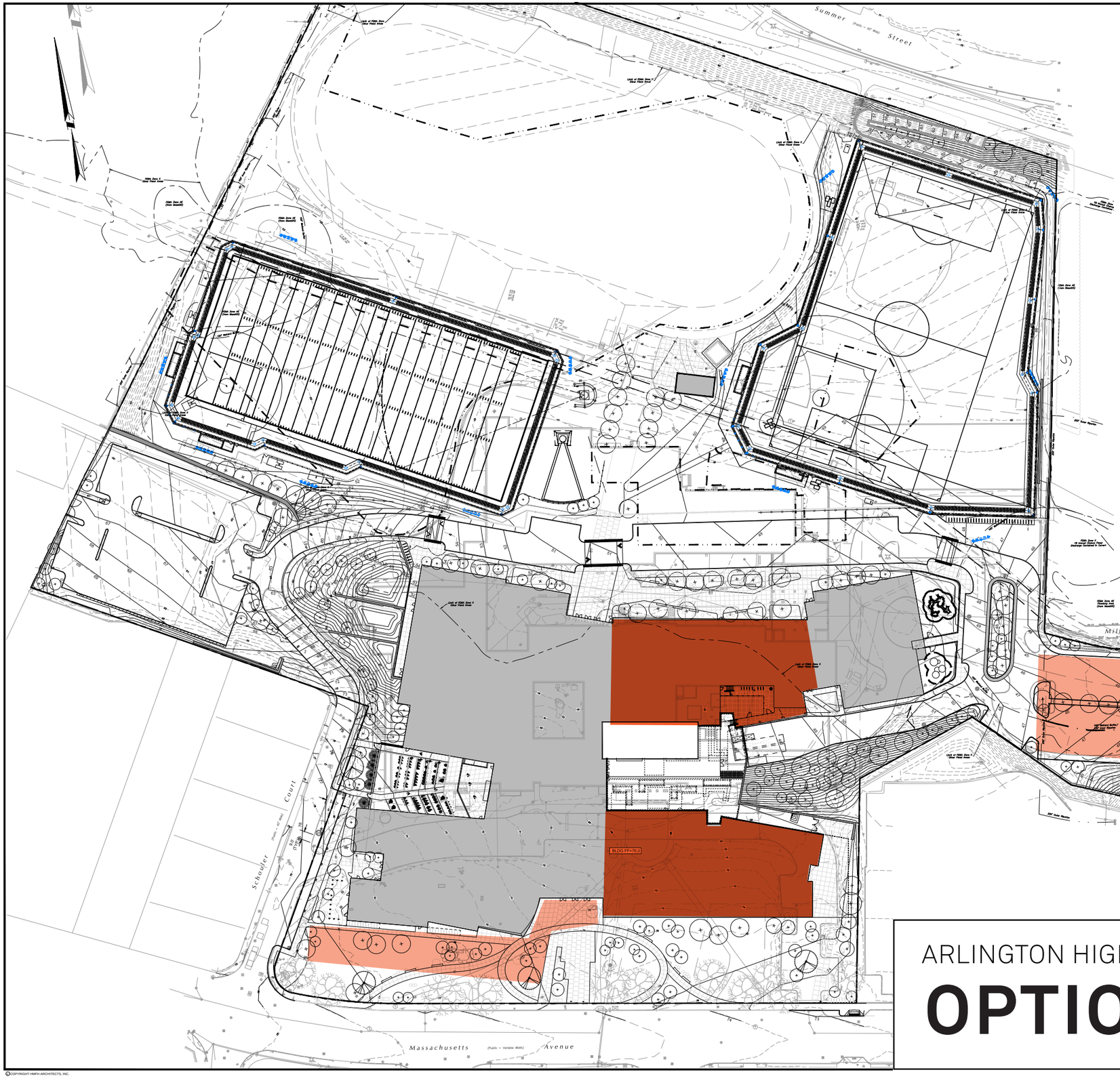

Impacts/Risks

- high risk of contaminants
- unknown future environmental impacts
- increase to project costs (est. $925k-$1.75m)
- impacts to construction logistics
- schedule impacts (TBD)
- impacts to school parking logistics (TBD $)
- revisions to mechanical design (est. $20k)

ARLINGTON HIGH SCHOOL GEO-WELL OPTIONS

OPTION 2A

HMFH ARCHITECTS
130 Bishop Allen Drive
Cambridge, MA 02139
617.547.5400
@HMFHarch hmfh.com

Simpkins Consultants Inc.
Civil/Structural/Land Planning
20 A Street
Framingham, MA 01701
T 508.877.6688
F 508.877.8349
www.skinsinc.com

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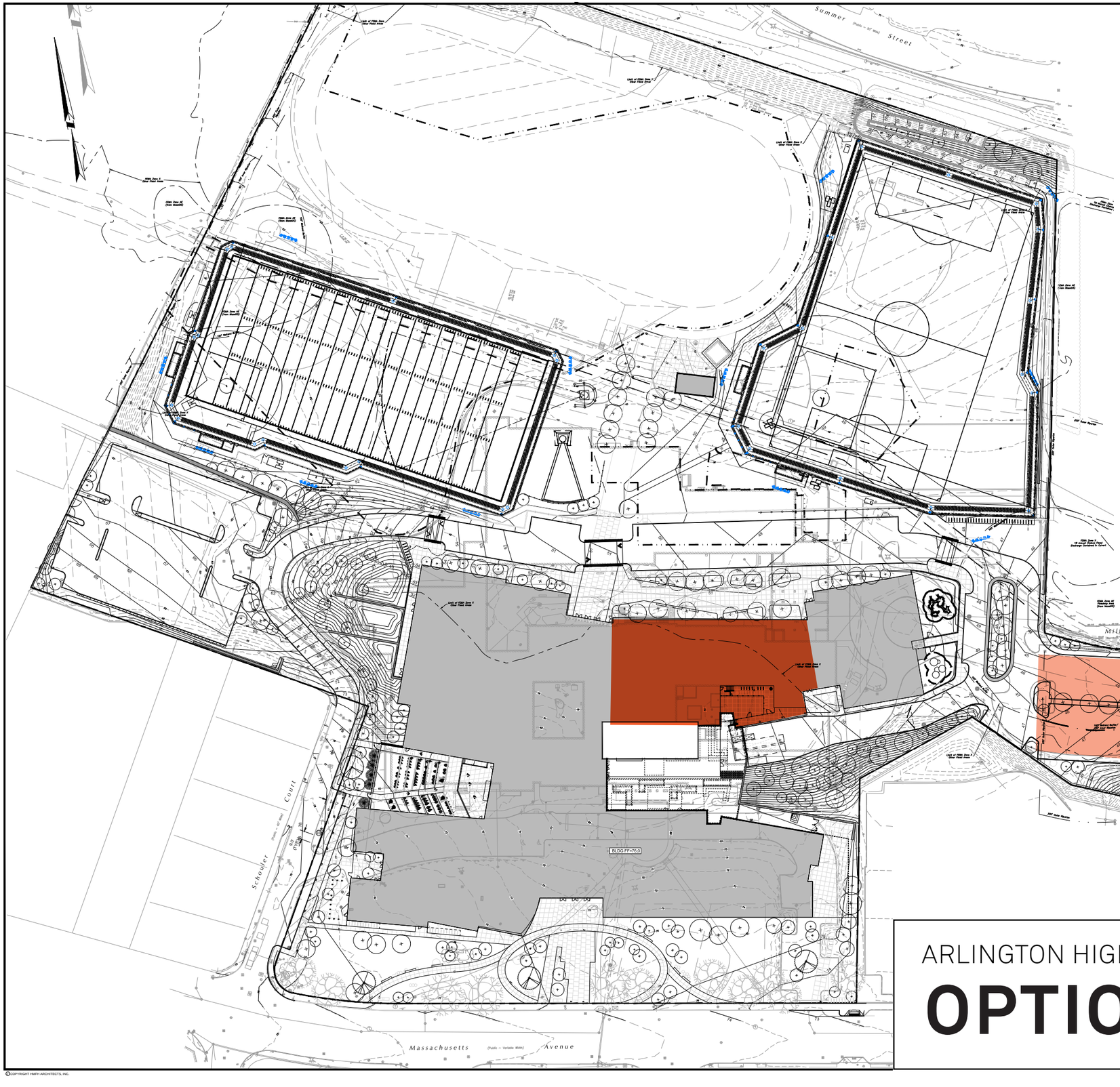

Impacts/Risks

- lower-level risk of contaminants
- unknown future environmental impacts
- potential increase to project costs (est. $460k-$875k)
- decrease to project costs (est. $2.5m)
- Humanities wing only served by geo wells
- impacts to school parking logistics (TBD $)
- revisions to mechanical design (est. $60k)
- schedule impacts (TBD)

ARLINGTON HIGH SCHOOL GEO-WELL OPTIONS

OPTION 3

HMFH ARCHITECTS
130 Bishop Allen Drive
Cambridge, MA 02139
T 617.547.5400
@HMFHarch hmfh.com

Simpkins Consultants Inc.
Civil/Structural/Land Surveyors
20 A Street
Framingham, MA 01701
T 508.877.6688
F 508.877.8349
www.skinsinc.com

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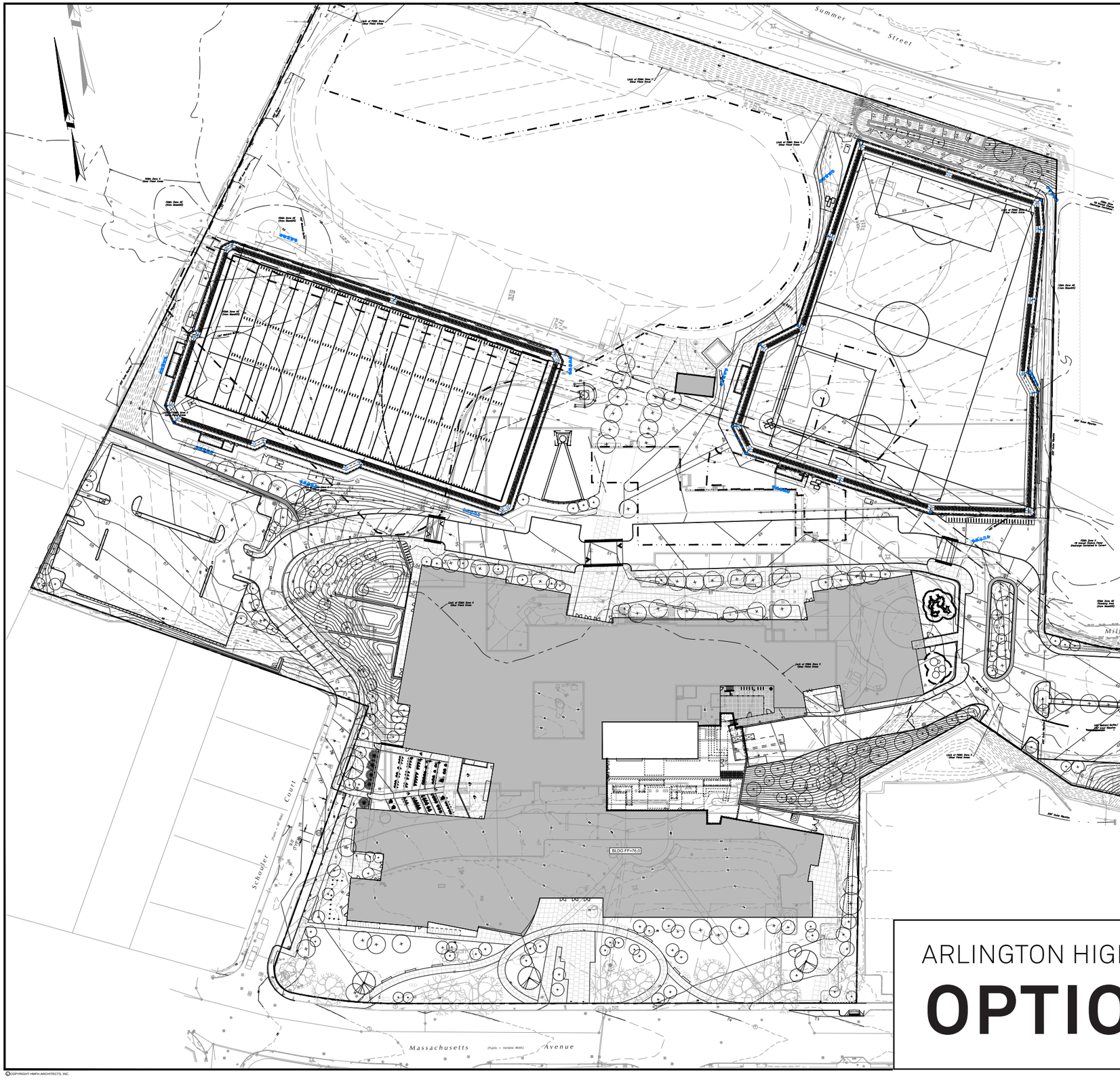

Impacts/Risks

- no risk of contaminants
- no future environmental impacts
- decrease to project costs (est. $5m)
- no geo wells but retains all-electric design
- revisions to mechanical design (est. $110k)
- schedule impacts (TBD)

ARLINGTON HIGH SCHOOL GEO-WELL OPTIONS

OPTION 4

HMFH ARCHITECTS
130 Bishop Allen Drive
Cambridge, MA 02139
T 617.547.5400
@HMFHarch hmfh.com

Simpkins Consultants Inc.
Civil/Structural/Land Surveying
20 A Street
Framingham, MA 01701
T 508.877.6688
F 508.877.8349
www.simplaw.com

CONSTRUCTION DOCUMENTS 60% ESTIMATING SET
03-18-2020

Memorandum

Date:	March 20, 2020
Recipient:	HMFH Architects
Copy To:	Ms. Lori Cowles and Mr. Arthur Duffy
Sender:	William J. Burns, L.S.P. and Jonathan W. Patch, P.E.
Project:	Arlington High School
Project No:	6531.2.TB
Subject:	Evaluation of Geothermal Well Field Options 1 through 4

The following summarizes our evaluation of four (4) geothermal well field installation scenarios for the Arlington High School project. The scenarios that were evaluated include the following: (1) Maintaining the Well Field at its Current Location; (2) Relocation of the Well Field; (3) Relocation of Well Field and Reduction of Well Field Size, and (4) Elimination of Geothermal Well Field.

As we have previously mentioned, it is our recommendation that the proposed geothermal well field is relocated from its current location (Pierce Practice Field and baseball field) to an alternative location at the School campus in order to mitigate the potential of exacerbating the existing contamination that is known to be present in soil and groundwater. The submittal and DEP approval of a Release Abatement Measure (RAM) Plan will be necessary for the installation of the geothermal wells in accordance with the provisions of Section 40.0444 of the Massachusetts Contingency Plan (MCP). Pursuant to Section 40.0170(7)(b) of the MCP, response actions (i.e. RAM activities) must not result in or cause hazard, or exacerbate an existing hazard to, health, safety, public welfare or the environment. Maintaining the proposed geothermal well field at its currently proposed location is not considered feasible under these provisions of the MCP due to presence of bedrock contamination, the extent of which has not adequately so that a well can be designed and installed in a manner that will not exacerbate the contamination.

Option 1: Maintaining the Well Field at its Current Location

Pros:

- Would maintain use of geothermal wells for both classroom wings.
- Only one mechanical room in the Phase 1 building is needed.
- Direct path for piping from well field to Phase 1 building mechanical room.
- Redesign of the geothermal well field is not necessary.

Cons:

- Given the extent of contamination in bedrock is unknown, it is likely infeasible to implement well design and installation procedures to eliminate potential exacerbation of the contamination.

- Premium cost for specialized drilling methods which will be required to minimize potential downward migration of contamination that is present in bedrock.
- Schedule impacts as a result of specialized drilling methods which will result in a slower production rate of the well installation.
- Additional waste streams (such as drilling mud) will be generated that will require additional on-site management and premium cost to dispose of off-site.
- Additional health and safety measures will be necessary to protect workers and the surrounding public from the odors that may be encountered during drilling through the bedrock contamination.
- Given the extent of contamination in bedrock is unknown, it will be difficult evaluate and defend against future potential claims against the Town of Arlington from adjacent properties who may encounter similar bedrock contamination.
- Schedule impacts. The Industrial Parties have indicated that their evaluation will not be complete until the end of May. Current AHS schedule has well field construction starting in May and completing by September to allow the new west parking lot to be constructed by the start of the school year.

Option 1A: Maintaining the Well Field at its Current Location but Reduce the Size

Previous analysis by McPhail indicated that 65 to 70, 900-foot deep Rygan wells would approximately equal the output of the currently designed well field. These wells utilize proprietary high-strength, low-weight, low thermal resistance composite materials

Pros:

- Decreasing the number of wells would reduce the footprint required for the well field(s) and result in less horizontal trenching and piping.
- Upon adequately defining the lateral extent of bedrock contamination, it may be feasible to strategically place a smaller well field within Pierce Practice Field and baseball field to avoid the bedrock contamination.
- Would maintain use of geothermal wells for both classroom wings.
- Only one mechanical room in the Phase 1 building is needed.
- Direct path for piping from well field to Phase 1 building mechanical room.
    - ~425 linear feet of supply-return piping from vault to mechanical room

Cons:

- Redesign of the geothermal well field is necessary.
- Schedule impacts for redesign.
- Premium cost for Rygan well materials.
- See Option 1 above for other Cons.

Option 2: Relocate Well Field to Other Portion(s) of Site

Pros:

- Adequate space is available at the northeast portion of the site, outside the limit of the Engineered Barrier, to install 130 geothermal wells.
- Alternately, the well field could potentially be split up as follows [Option 2A]:

- Install approximately 30 to 35, 900-foot deep Rygan wells in the Front Green for the Phase 1 Building.
- Install approximately 65, 500-foot U-bend wells or 30 to 35, 900-foot deep Rygan wells in the northeast portion of the site.

Cons:

- Further evaluation of bedrock contamination is necessary at the portions of the site under consideration.
- Redesign of the geothermal well field is necessary.
  - Schedule impacts for redesign.
- Premium costs for Rygan well materials.
- Relocation of the horizontal piping from well fields at alternative portions of the site to the current to the Phase 1 building mechanical room will increase the pumping power required, thus resulting in more electrical use.
  - ~1,500 linear feet of supply-return piping from vault in northeast corner of site to mechanical room.
- Dividing the well field onto multiple portions of the site would likely require a second mechanical room in the Phase 2 building [Option 2A].

Unknowns:

- If bedrock contamination is present and adequately defined a specialized well design as well as specialized drilling techniques would be necessary to eliminate the potential exacerbation of contamination. As referenced above, the specialized design and drilling techniques will also increase the time and cost to install each well.

Option 3: Relocate Well Field to Other Part of Site and Reduce the Number of Wells

Pros:

- Eliminating geothermal to heat and cool the Phase 1 STEAM wing would allow more time to properly evaluate options to use geothermal wells for the Phase 2 humanities wing.
- Adequate space is available at the northeast portion of the site, outside the limit of the Engineered Barrier, to install 130 geothermal wells.
- Alternately, the well field could potentially only service the Phase 1 or Phase 2 classroom wing and consist of the following:
  - Approximately 30 to 35, 900-foot deep Rygan wells located in the Front Green for the Phase 1 building.
  - Approximately 65, 500-foot U-bend wells or 35, 900-foot deep Rygan wells in the northeast portion of the site for the Phase 2 building.

Cons:

- Redesign of the MEP and structural system of the Phase I building would be needed.
- Redesign of the geothermal well field is necessary.
  - Schedule impacts for redesign.

- Premium cost for Rygan well materials.
- Running the horizontal piping from a well field located in the northeast portion of the site to the Phase 1 building mechanical room will increase the pumping power required, thus resulting in more electrical use.
    - ~1,200 to 1,500 linear feet of supply-return piping from vault to mechanical room.

Unknowns: See Option 2.

Option 4: Eliminate Geothermal Wells from the Project

Pros:

- Eliminates unknowns and risks associated with potentially exasperating the contamination.

Cons:

- Redesign of HVAC system.
    - Schedule impacts for redesign.
- Increased carbon footprint.
- Redesign of structure to support additional mechanical equipment.
    - Schedule impacts for redesign.

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JWP/WJB

GEOTECHNICAL AND GEOENVIRONMENTAL ENGINEERS
2269 Massachusetts Avenue
Cambridge, Massachusetts 02140
(617) 868-1420

Field Report

Date:	February 24, 2020
Time:	7:00AM- 5:30PM
Weather:	Sunny, 55 F
Representative:	Mike Doneghey Tom Cormican

Recipient:	HMFH Architects, Inc.
Project:	Arlington High School; Arlington, Massachusetts
Project No:	6531.2.TB
Present on Site:	Ogden Well and Pump Company (Geothermal Well Contractor) Brown & Caldwell (Chuck Myette) Skanska – Hal Raymond and Jim Burrows Cashins & Associates (Ogden's Health and Safety Consultant)

The above-named representatives of McPhail were present at the above referenced site to observe the drilling of the geothermal test well.

Prior to the commencement of work, a site health and safety meeting was held at which employees of Ogden, McPhail Associates, Skanska as well as Thor Helgason (de Maximis, Inc.) and Chuck Myette (Brown & Caldwell) were in attendance. During this meeting, the nature and extent of contamination, as well as exposure potential to the contamination was conveyed by Chuck and Thor with additional input from McPhail.

Two tri-pod mounted DustTrak II dust monitors were set up adjacent to the fence separating the soccer field from the adjacent Arlington High School parking lot and near the walkway which runs along the northern end of the soccer field.

Following the meeting, Ogden set up the drilling equipment at the location of test well #1 (proposed production well GW-64) on the practice soccer field. The fencing contractor showed up soon after and placed temporary 6-foot high chain link fencing around the work zone. As drilling operations began, the owner/operator of Ogden, Mr. Thomas Ogden, communicated to the above-named representative that the hole was being advanced through the soil overburden with the use of an 8-¾ inch tri-cone roller bit and compressed air supplied by the drill-rig.

Field Report

Date: February 24, 2020

Time: 7:00AM- 5:30PM

Weather: Sunny, 55 F

Representative: Mike Doneghey
Tom Cormican

At the start of drilling operations, Ogden encountered a layer of granular fill material the thickness of which could not be accurately measured during the advancement of drilling. However, at a depth of 25 to 30 feet below ground surface it was visually apparent that the drilling had extended into a natural, glacial outwash deposit. At approximately 50 feet below ground surface, the driller encountered a running sand deposit that clogged the drill bit and hindered the air return of the drill rig. After removing the rods, the driller utilized a Takeuchi TB235 mini-excavator to dig a sump pit for capturing slurry that was subsequently introduced into the drilling operation. This slurry consisted of bentonite powder and water. The sump pit consisted of a 2 to 3-foot deep hole which was located adjacent to the test borehole. The upper 2 feet of soil were stockpiled for later use as backfill material, whereas all soil below this depth was required to be placed on a polyethene sheet and later placed in a roll-off container set to be delivered tomorrow.

After preparation of the slurry material, the driller placed the drill bit and rods back onto the drill-rig and continued drilling past the running sand and into the denser outwash deposit which was encountered at approximately 55 feet below ground surface. At 60 feet

below ground surface the driller encountered the natural glacial till, followed by diorite bedrock at approximately 67 feet below ground surface. The driller continued an additional twelve (12) feet into bedrock to facilitate the installation of 6" diameter steel casing, the bottom which of was set at a depth of 79 feet below ground surface.

It is noted that while delivering the two (2) wastewater holding tanks, the subcontractor for Ogden experienced a hydraulic line break which spilled about 2 gallons of a vegetable oil based hydraulic fluid onto the underlying pavement. A MSDS for the vegetable oil hydraulic fluid was provided by Ogden drilling. Mr. William Burns LSP, with McPhail Associates, and representatives of Skanska were notified of the situation. It was subsequently determined that this spill did not require DEP notification. The truck driver cleaned the spill with the use of a spill kit and kitty litter purchased from a local store. The impacted material was placed in a five (5) gallon bucket and will be properly disposed of off-site. In addition, fencing was placed around the wastewater holding tanks.

After reaching the depth of 79 feet below ground surface, the driller removed the drill rods and began installation of the six (6) inch inside diameter steel coupled casing in approximately twenty (20) foot lengths. The casing was lowered into the hole until it was obstructed at 40 feet below ground surface. The contractor attached a solid aluminum plug to the top of the casing and utilized the air hammer to drive the casing down to 79 feet below ground surface. After removing the aluminum plug, the driller placed the air hammer attached to the drill rods down into the hole and with a combination of compressed air and water supplied by the truck, was able to advance down further.

After continuing drilling operations, a change in rock type was encountered at approximately 80 feet below ground surface, whereas the rock was notably a pink granite with a drilling rate of approximately 12 minutes per 20-foot drill rod. The water from the drilling operation was pumped into the recently delivered tanks as needed.

At a depth of approximately 95 to 100 feet below ground surface a change in rock type, back to the previously observed diorite granite, was observed by the above referenced representative and the drillers. The representative then prepared to collect a sample of the material, at which point the drillers noted a "moth ball" odor in which the representative identified was likely the odor of Naphthalene. Naphthalene is a typical constituent

associated with coal tar (a by-product of coal gas manufacturing) and is a contaminant of concern associated with the above referenced historical contamination. During the drilling operations, Chuck Myette (LSP for Arlington Remedial Action Settlement Trust) was on-site and was made aware of this olfactory evidence of contamination.

A call was made to William Burns informing him of the situation, in which case he recommended the ambient air around the drill hole and cuttings from the hole be screened with a photoionization device (PID). The odor continued as the drillers advanced the hole. Air readings around the drill hole did not exceed a headspace reading of 4.5 part per million (ppm) and headspace of the cuttings were less than 1 ppm. Shortly thereafter, after discussing this with William Burns by telephone, the advancement of drilling was suspended at a depth of about 160 feet below ground surface.

Soon thereafter, William Burns and Jonathan Patch from McPhail arrived on-site and discussed the situation with Chuck Myette and Tom Ogden. The drill rods were sent to the bottom of the borehole to determine if water was present. Water was not observed but during the process, which involved running compressed air through the drill rods, a heavy “mothball” odor was observed. It was determined at this time to suspend drilling for the remainder of the day and prior to continuing drilling further the next morning that an evaluation would be performed to determine if groundwater came into the drill hole overnight.

At the end of the day the site was closed off with the temporary chain link fence which had been delivered in the morning, and the hole around the drill head was covered for the night by Ogden.

Field Report

Date:	February 25, 2020
Time:	6:30AM- 5:00PM
Weather:	Sunny, 55 F
Representative:	Mike Doneghey

Recipient:	HMFH Architects, Inc.
Project:	Arlington High School; Arlington, Massachusetts
Project No:	6531.2.TB
Present on Site:	Ogden Well and Pump Company (Geothermal Well Contractor) Skanska (Hal Raymond) Cashins & Associates (Ogden's Health and Safety Consultant)

The above-named representative was present at the above referenced site to observe the drilling of the geothermal test well.

Upon arrival to the site, a 12 cubic yard roll-off container that will be utilized for drill cuttings and excess soil was delivered to the site. The container was placed on the paved walkway located north of the drilling operations. The roll-off was enclosed by the temporary construction fencing.

Two tri-pod mounted Dust Trak II dust monitors were set up adjacent to the fence separating the soccer field from the adjacent Arlington High School parking lot and near the walkway which runs along the northern end of the soccer field. It is noted that this road/walkway was blocked off and students were told to take an alternate route around the drilling operation along the far south side of the field.

An evaluation for the presence of groundwater was performed prior to continuing of drilling. Specifically, starting at a depth of about 120 feet the drilling rod was advanced downward at 5 to 10-foot increments in which compressed air was injected into the borehole. During this evaluation, evidence of groundwater was only encountered at the bottom of the borehole at about 160 feet, where the injection of air brought a small amount of water and non-aqueous phase liquid (oily substance) to the ground surface. The representative called Jonathan Patch and William Burns and was instructed to cease all drilling operations. A sample was taken of the material encountered and no further drilling took place.

Field Report

Date: February 25, 2020

Time: 6:30AM- 5:00PM

Weather: Sunny, 55 F

Representative: Mike Doneghey

Picture of Oily Substance Observed Coming out of Well Head

Soon thereafter Jonathan Patch and William Burns arrived on-site. Subsequently, it was determined by McPhail that continued drilling could potentially "drag down" contamination during the advancement of the borehole and thus would potentially exacerbate the release condition. As a result, McPhail indicated to Ogden that further drilling would not continue at this test well location and that they should fill the hole with a bentonite grout.

Additional excavation around the well head was performed to allow for the overflow of grout and keep it contained to the hole during the grouting operation. The top four (4) feet of the casing was cut-off by Ogden, down to approximately one (1) foot and nine (9) inches below surrounding grade. Approximately twelve (12) bags of GeoPro Inc. grout mix

were mixed with water and poured into the hole with the use of a tremie tube. By marking the length of each section of the tremie tube, the above-named representative and the driller confirmed the tremie tube was advanced to a depth of 160 feet. The grout was placed in the hole by means of the tremie tube until grout return was observed overflowing the top of the steel casing. The leftover grout material was discarded in the onsite roll-off.

The drilling area was fenced off and the hole was covered for the night by Ogden.

Field Report

Date:	February 26, 2020
Time:	7:00AM- 3:30PM
Weather:	Sunny, 55 F
Representative:	Mike Doneghey

Recipient:	HMFH Architects, Inc.
Project:	Arlington High School; Arlington, Massachusetts
Project No:	6531.2.TB
Present on Site:	Ogden Well and Pump Company (Geothermal Well Contractor)

Today, the above-named McPhail representative was on-site to observe the cleanup and demobilization of Ogden. The contractor, Ogden Well and Pump Company (Ogden), excavated the soil within the pit around the well head down to approximately three (3) feet below the original grade. The grass and topsoil to about 2 to 4 inches below-grade in the immediate surrounding area was removed as well. The excavated material was placed in the onsite roll-off.

The head of the steel casing, which had been previously filled with grout, was then covered in cement, after which thirty-six (36) bags of industrial quartz sand were used to backfill the dewatering pit. After placement of the sand, the soil which was initially excavated from the top two (2) feet of the drilling site was placed in the hole above the sand as additional fill material. At this point in time, the fill had reached approximately one (1) foot below-grade. Additional loam, to be used as fill material, was scheduled to be placed tomorrow morning by Ogden provided it did not rain, in which case, they would place it Friday. The test well site was fenced in at the end of the day, and the hole was covered with plastic sheeting.

GEOTECHNICAL AND GEOENVIRONMENTAL ENGINEERS
2269 Massachusetts Avenue
Cambridge, Massachusetts 02140
(617) 868-1420

Project: **Arlington High School - EBP#2**
Location: **Arlington , MA**
Date: **3/23/2020r**
Proposal: **Budget**

Gross Area (SF):

CSI	DESCRIPTION	EBP #2 Estimate With Wells	EBP #2 Estimate Without Wells	Eliminate Wells Delta
21.01	**FIRE PROECTION (TS)**	**172,581**	**172,581**	**-**
22.01	**PLUMBING (TS)**	**104,528**	**104,528**	**-**
26.01	**ELECTRICAL (TS)**	**319,577**	**319,577**	**-**
31.01	**SITEWORK**	**9,291,300**	**8,053,300**	**(1,238,000)**
31.21	**TEMPORARY FENCE**	**272,060**	**272,060**	**-**
33.04	**GEOTHERMAL WELLS**	**2,470,000**	**-**	**(2,470,000)**
	Sub Total of Trades	**12,630,046**	**8,922,046**	**(3,708,000)**
1.4% of non-trades	Subcontractor Default Insurace	168,467	116,555	(51,912)
6.00%	Design & Estimating Contingency	757,803	535,323	(222,480)
1.00%	Escalation	-	-	-
	Sub Total	**13,556,316**	**9,573,924**	**(3,982,392)**
LS	General Conditions	-	-	-
LS	General Requirements	650,000	500,000	(150,000)
	P&P Bond	113,714	75,554	(38,160)
	Builder's Risk	-	-	-
1.20%	General Liability Insurance	181,942	152,242	(29,700)
		14,501,972	**10,301,720**	**(4,200,252)**
2.50%	Construction Contingency	362,549	257,543	(105,006)
2.00%	Fee	297,290	211,185	(86,105)
	TOTAL COST	**15,161,812**	**10,770,449**	**(4,391,363)**